REMARKS / ARGUMENTS

Claims 1-12 have been rejected under 35 USC 102(b) as being anticipated by Michael, US Pat. 5,640,200 ("Michael").

Michael is an example of the prior art discussed in the Background section of the Specification of Applicant's application. In particular, the Background states on page 3, lines 17-22, that: "In a least certain conventional machine-vision systems, there is no distinction between the region of interest (i.e., window) used to train the alignment (registration) template and the region of interest (i.e., window) used to train the inspection template. However, the conventional usage of the same window creates a number of problems both at training and run-time." Each Golden Template in Michael represents a region of interest that is used for **both** registration and inspection of the region-of-interest. See, for example, col. 3, lines 59-64, stating that "the entire image can be used for registration"; the same entire image that is used for inspection as a Golden Template. This teaches away from Applicant's invention, wherein only "a region of alignment interest **within** an object image" is used for registration, as required by amended claim 1, for example.

An enclosing boundary of a Golden Template defines the full contents of the Golden Template that are expected to substantially register (align) with respect to the full contents of a region of interest to be inspected using the Golden Template by way of a Golden Template Comparison (GTC) analysis.

First the Golden Template must be aligned with the region of interest to be inspected, and then the same Golden Template is used to inspect the same region of interest. Thus, each new region of interest to be inspected using the Golden Template must first be the aligned with the Golden Template.

Said another way, Michael represents an approach termed "single alignment, **single** inspection", whereas Applicant's invention represents "single alignment, **multiple** inspection", as stated on line 15 of page 8 of the specification. This is because each region of interest that has been specialized for alignment (registration) is associated with a plurality of regions of interest that are to be inspected by a respective inspection tool, as required by claim 1, for example.

It will be useful to more clearly define some terms that are being used in the specification, the cited references, and by the Examiner. It is useful to define a "window" as being an enclosing rectangle, the enclosing rectangle being an example of an enclosing boundary. Other enclosing boundaries can be squares, circles, ovals, or hexagons, for example. A "region of interest" is defined by an enclosing boundary, i.e., a boundary that encloses all features within a region, including all other enclosing boundaries within the region of interest defined by the enclosing boundary. Thus, for example a "window" is an enclosing boundary that defines a region of interest, the region of interest being usually of a square or rectangular shape.

Prior to the invention, in the field of machine vision inspection, the region of interest within an enclosing boundary, e.g., a window, was of "interest" for purposes of **both** alignment **and** inspection. However, the invention employs the idea that an enclosing boundary can define an area of an image for the limited purpose ("interest") of **either** alignment **OR** inspection. Thus, the claims have been amended so as to make more clear that an "alignment region" is a region of interest selected for alignment, i.e., is a "region of alignment interest", and an "inspection region" is a region of interest selected for inspection, i.e., a "region of inspection interest". The amended claims further specify that each "region of inspection interest" is associated with at least one inspection tool.

The Examiner asserts that "specifying an alignment region" is taught by Michael, citing col. 2, lines 6-15, and col. 12, lines 52-54. In col. 2, lines 6-15, Michael teaches both a single-fiducial and multiple-fiducial registration process. A fiducial is an extraneous feature that is added to the object for the purpose of facilitating alignment. By contrast, Applicant teaches and claims, as herein amended, a registration process that employs a region of alignment interest that can include one or more object features that are not usually or necessarily used for alignment, but can be so-used in addition to another purpose related to the object, as illustrated in Fig. 2.

It is understood by those skilled in the art of machine vision that a "fiducial" is **added** to an object. By contrast, a "region of alignment interest" is a region of the object image that is already part of the object, and further, is useful for

alignment due to the nature of the features contained within the region. For example, features within a "region of alignment interest" would tend to be stable and defect-free, as stated in the specification on page 4, lines 6-7. Note that it's possible for a fiducial to be included in a region of alignment interest. Note also that a fiducial is NOT needed within a region of alignment interest. Thus, a fiducial is not a "region of alignment interest" as required by Applicant's claims. Thus, Michael does not teach a "region of alignment interest", and therefore lacks the first element of claims 1 and 7, for example.

#1

Regarding the second element of claims 1 and 7, the Examiner states that Michael teaches "an alignment region with a plurality of inspection regions", citing col. 1, lines 52-60. However, at col. 1, lines 52-60, merely state that: "a ... 'template' ... may consist of a collection of regions". By contrast, the second element of claim 1, as amended herein, requires "associating the single region of alignment interest with a plurality of regions of inspection interest within the object image". Claim 7 requires "identifying a plurality of regions of inspection interest within the run-time image-data **using** the specified region of alignment interest". Thus, Michael lacks the essential **association** of a single region of alignment interest with a plurality of regions of inspection interest. In other words, an important aspect of the invention is that a single alignment can be used to facilitate a plurality of inspections. This idea is not taught, suggested, or motivated by Michael. Thus, the second element of claims 1 and 7 is absent from Michael.

#2

Regarding the third element of claims 1 and 7, the Examiner asserts that Michael teaches "associating each of the plurality of inspection regions with at least one inspection tool", citing col. 15, lines 5-9, and col. 16, lines 15-18. The Examiner asserts that photometrics, geometrical measurements, and gray-scale mathematical morphology correspond to inspection tools. However, Michael fails to associate at least one inspection tool with each of the plurality of inspection regions. This is because Michael lacks the "plurality of regions of inspection interest" that are associated with a "region of alignment interest". In fact, Michael does not teach **associating** an inspection tool with **any** region of interest. Thus, Michael lacks the third element of claims 1 and 7.

Regarding the fourth element of claim 1, "performing training for each of the plurality of inspection regions for each of the associated inspection tools", Michael does not have the "associated inspection tools". The Examiner cites col. 14, lines 43-46, but that text merely refers to statistical training to obtain a Golden Template, not to a plurality of inspection regions associated with a single alignment region, as taught and claimed by Applicant. Thus, Michael lacks the fourth element of claim 1.

Consequently, since Michael lacks all four elements of claim 1, and all three elements of claim 7, the rejection of claims 1 and 7 is deemed to be overcome.

Regarding claim 8, for the reasons stated above regarding the absence of at least the fourth element of claim 1, the rejection of claim 8 is deemed to be overcome.

Regarding claim 2, Michael merely mentions statistical training in general at col. 14, lines 42-46. Moreover, one of average skill in machine vision knows that Golden Template Comparison requires statistical training of a Golden Template. However, Michael is silent on "at least one respective inspection tool" for each of the "regions of inspection interest", as now required by amended claim 1, from which claim 2 depends. Accordingly, the rejection of claim 2 is deemed to be overcome.

Regarding claims 3 and 9, at col. 14, lines 3-8, Michael does not discuss training, instead discussing Global Contrast Normalization. Further, since the computation is for each pixel in the image, there is no discussion of "region", since a region is a collection of pixels, not a single pixel, and not all pixels in an image. Thus, there is also no discussion of "order" of inspections regions, since there are no regions discussed. Moreover, claims 3 and 9 depend from claims 1 and 7, each of which is deemed to be allowable. Accordingly, the rejection of claims 3 and 9 is deemed to be overcome.

Regarding claims 4 and 10, the Examiner cites col. 15, lines 46-53, which discusses adjustment of two parameters to affect the value of a threshold of a pixel. Although the parameters can be adjusted differently for each pixel, Michael is silent on adjusting them in a pattern as taught and claimed in

Applicant's invention, i.e., a plurality of regions of inspection interest associated with a single region of alignment interest. In fact, Michael teaches away from Applicant's invention at col. 15, line 22, stating "Clearly, each pixel position should have its own threshold". Again, since the definition of a region requires a plurality of pixels that are treated in the same way, Michael teaches away from creating a region, and therefore certainly teaches away from the invention, which requires a relationship among a plurality of regions, each region being treated differently.

The Examiner has also cited col. 15, line 55 – col. 16, line 2. Here, Michael is discussing a plurality of pixels that make up a defect, not a region of inspection interest, since it's well known in the art of machine vision that defects appear within a region of inspection interest, and are detected and evaluated therein. This clearly requires that a defect is **not** the same as a region of inspection interest. Further, cited col. 15, line 55 – col. 16, line 2 does not discuss the claimed subject matter, i.e., is silent on **associating** a first inspection tool with a first region, and **associating** a different inspection tool with a second region. Instead, Michael is teaching the advantages of combining inspection criteria to analyze defects. Moreover, claims 4 and 10 depend from claims 1 and 7, respectively, each of which are deemed to be allowable. Accordingly, the rejection of claims 4 and 10 is deemed to be overcome.

Regarding claims 5 and 11, although col. 16, lines 45-47 are cited, an equation of an error image is taught, not an inspection tool. One of average skill

in the art of machine vision knows that inspection tools take images, such as an error image, as input. Consequently, an error image is not an inspection tool. (Examples of inspection tools include: blob, caliper, search.) Thus, there cannot be a first inspection tool and a second inspection tool. Consequently, there cannot be training of a first and second inspection tool. Moreover, claims 5 and 11 depend from claims that are deemed to be allowable. Accordingly, the rejection of claims 5 and 11 is deemed to be overcome.

Regarding claims 6 and 12, col. 15, lines 55-58 were cited, yet these lines are silent on training of an inspection tool. Consequently, there cannot be an order of performance of training, as required by claims 6 and 12. Further, both of these claims depend from claims deemed herein to be allowable. Accordingly, the rejection of claims 6 and 12 is deemed to be overcome.

Claims 13-23 have been rejected under 35 USC 103(a) as being unpatentable over Kristol et al. U.S. Pat. 5,668,874 ("Kristol") in view of Michael. Kristol teaches a scanner-based system, whereas Applicant teaches and claims a camera-based system in claims 13-23. Kristol does not once teach, suggest, or motivate the use of a camera instead of a scanner, instead teaching a scanning means 210 in Fig. 2, recommending "preferential scanning" as a way to achieve enhanced throughput (see col. 5, lines 39-40) as a preferred mode. Note that claim 13 explicitly requires a camera in the first element. Kristol lacks the first element.

Kristol also lacks a display that displays the acquired image data. Instead, the display in Kristol displays only simple status information regarding presence or absence of verification. In fact, a display is not needed at all, and Kristol says that a simple light or tone would also serve the purpose (col. 5, lines 51-55). Thus, Kristol lacks the second element.

Kristol does not have the third element, since the display of Kristol does not display the acquired image, and the third element requires that a processor be coupled to a display that displays acquired image-data.

Kristol does not have the fourth element, since the memory buffer must be coupled to the display that displays the acquired image data.

Kristol does not have the fifth element, since Kristol lacks both a camera and a display that displays the acquired image-data.

Kristol does not have the sixth element, since Kristol lacks the display that displays the acquired image, lacks the processor coupled to the display that displays the acquired image, lacks the memory buffer coupled to the display that displays the acquired image, and lacks a visual data acquisition system coupled to a camera, since it lacks a camera.

Kristol does not have a seventh element, since Kristol lacks the display that displays the acquired image, the processor coupled to a display that displays the acquired image, the memory buffer that must be coupled to the display, the visual data acquisition system that must be coupled to a camera, and the user

interface that must be coupled to the display that must display the acquired image.

Thus, Kristol lacks all the elements of claim 13, and so the "wherein" clause is moot, since it requires the presence of the prior elements.

Nevertheless, Kristol also lacks a "region of alignment interest" within the acquired image-data". Kristol teaches "registration features 40". However, Kristol is silent on a region within which to look for the registration features 40. One skilled in the art of machine vision knows that one searches for fiducial marks within an area or region of an image. Thus, a fiducial cannot be a region. Therefore, Krisol does not teach a "region of alignment interest", as required by claim 13.

Further, Kristol teaches that "The perimeter of the image area may also serve as a registration feature". However, this teaches away from Applicant's invention, since the image region is also being inspected, and so the image region and it's perimeter are being used for both registration and inspection. By contrast, Applicant's invention includes dedicated regions of inspection interest and dedicated regions of alignment interest, which regions are associated, but not the same.

The Examiner admits that Kristol does not teach performing training for each of the plurality of inspection regions for each of the associated tools. Michael discloses training of Golden Templates, as cited by the Examiner. However, Kristol does not teach, suggest, or motivate the use of a Golden

Template. Michael states at col. 9, lines 45-48 that Golden Template analysis is particularly suited to flaw and defect detection using 2-D images that do not suffer from geometric distortions. However, Kristol teaches a method for verification, NOT flaw and defect detection. For example, Kristol uses an image signature that is derived from a good image, teaching away from using a Golden Template, since a Golden Template is a more perfect image than any single image used in training of the Golden Template. Further, an image signature represents a **compression** of the data of the good image, whereas a Golden Template actually is an **expansion** of the data respect to any good image that is part of the ensemble of good images that is used to create a Golden Template.

Moreover, compression results in data loss, and therefore, Kristol could not possibly know WHY the card failed verification, and indeed, the display does not present the reason; merely presenting a pass/fail signal col. 5, lines 51-55. By contrast, Applicant's invention provides the means to provide detailed information using inspection tools optimized to perform in inspection regions that are associated with alignment regions that are optimized for alignment tools, the results of the inspection being presented in full detail via a display.

Another reason why using Golden Template training of Michael with the verification system of Kristol is that the system of Kristol is "self-verifying". That means that the card includes the image signature. This is possible because the image signature is a compression of the full card image. By contrast, the Golden template is the same size and of higher quality than a typical image. There

would not be room for a Golden Template image on the card, since the card has only room for one image, and including the Golden template would require room for two images on one card. Thus, it's impossible to use a Golden Template as an image signature. Consequently, using a Golden Template from Michael with the verification system of Kristol would not provide a working device; there would be no reason or motivation to combine them.

Consequently, the rejection of claim 13 under 35 USC 103(a) is deemed to be overcome.

Regarding claim 14, since Kristol lacks a camera, instead teaching a variety of scanners, and since claim 14 depends from claim 13, herein deemed allowable, claim 14 is also deemed to be allowable.

Regarding claims 15, 16, 17, 18, and 19, refer to the response to the rejection made for claims 2, 4, 5, 1 and 13, above. The rejection of claims 15-19 are therefore deemed to be overcome.

Regarding claim 20, since this claim depends from claim 13, herein deemed allowable, in part due to the fact that Michael cannot be combined with Kristol, the rejection of claim 20 is deemed to be overcome.

Regarding claim 21, since this claim depends from claim 13, herein deemed allowable, in part due to the fact that Michael cannot be combined with Kristol, the rejection of claim 21 is deemed to be overcome.

Regarding claim 22, since this claim depends from claim 13, herein deemed allowable, in part due to the fact that Michael cannot be combined with Kristol, the rejection of claim 22 is deemed to be overcome.

Regarding claim 23, since both Kristol and Michael are silent on a "blank scene" inspection tool, and since claim 23 depends from claim 13, herein deemed allowable, claim 23 is also deemed to be allowable.

The prior art made of record and not relied upon does not appear to present an impediment to the allowance of the present application.

Accordingly, Applicants assert that the present application is in condition for allowance, and such action is respectfully requested. The Examiner is invited to phone the undersigned attorney to further the prosecution of the present application.

Respectfully Submitted,

Dated: 12/12/03

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